WHAT IS CLAIMED IS:

1 1. An apparatus having an inter-module data transfer

2 confirming function comprising:

3 a first module;

4 a second module;

5 a bridge module connected said first module

6 and said second module through interface buses to

7 connect said first module and said second module to

8 each other so that data can be transferred between said

9 first module and said second module; and

10 a confirmation code setting means for setting,

11 in said bridge module, a confirmation code for

12 confirming data transfer from said bridge module to

13 said second module when said first module transfers

14 data to said second module via said bridge module

15 through said interface buses;

16 said first module comprising:

17 a descriptor setting means for

18 setting a data transfer descriptor containing

19 transfer information required for data transfer to

20 said second module and a data transfer confirmation

21 flag;

22 a descriptor generating means for

23 automatically generating, when said data transfer

24 confirmation flag is "ON", a data transfer

25 confirmation descriptor containing confirmation code

26 reading information, which is required to read out

27 said confirmation code from said bridge module to said

28 first module, on the basis of said transfer

29 information in said data transfer descriptor set by

30 said descriptor setting means; and

31 a controlling means for controlling

32 data transfer to said second module according to said

33 transfer information in said data transfer descriptor

34 set by said descriptor setting means, and for

35 controlling, when said data transfer confirmation

36 flag is "ON", after the data transfer to said second

37 module is completed, reading of said confirmation code

38 from said bridge module according to said confirmation

39 code reading information in said data transfer

40 confirmation descriptor automatically generated by

41 said descriptor generating means.

1 2. The apparatus having an inter-module data transfer

2 confirming function according to claim 1, wherein said

3 first module comprises:

4 a first processing unit for generally

5 managing said first module;

6 a second processing unit for carrying out

7 data transfer through said interface buses according

8 to an instruction from said first processing unit;

9 said first processing unit fulfilling a

10 function as said descriptor setting means; and

11 said second processing unit fulfilling

12 functions as said descriptor generating means and said

13 controlling means.

1 3. The apparatus having an inter-module data transfer

2 confirming function according to claim 1, wherein said

3 first module further comprises:

4 a first determining means for determining

5 whether data transfer between said bridge module and

6 said second module has been carried out normally or

7 abnormally, on the basis of said confirmation code

8 read out from said bridge module; and

9 a second determining means for determining

10 whether data transfer between said first module and

11 said bridge module has been carried out normally or

12 abnormally.

1 4. The apparatus having an inter-module data transfer

2 confirming function according to claim 3, wherein when

3 said first determining means determines that the data

4 transfer has been carried out abnormally, said

5 descriptor generating means automatically generates

6 an error reading descriptor containing error reading

7 information required to read out detailed error

8 information from said bridge module to said first

9 module, and said controlling means controls reading

10 of said detailed error information from said bridge

11 module according to said error reading information in

12 said error reading descriptor automatically

13 generated by said descriptor generating means.

1 5. The apparatus having an inter-module data transfer

2 confirming function according to claim 4, wherein said

3 first module comprises:

4   a first processing unit for generally

5 managing said first module;

6   a second processing unit for carrying out

7 data transfer through said interface buses according

8 to an instruction from said first processing unit;

9   said first processing unit fulfilling

10 functions as said descriptor setting means and said

11 second determining means; and

12   said second processing unit fulfilling

13 functions as said descriptor generating means, said

14 controlling means and said first determining means.

1 6. The apparatus having an inter-module data transfer

2 confirming function according to claim 5, wherein when

3 said second determining means determining that the

4 data transfer has been carried out abnormally, said

5 first processing unit obtains, from said second

6 processing unit, said detailed error information read

7 out from said bridge module, and instructs said second

8 processing unit to re-transfer the data on the basis

9   of said detailed error information.

1   7. The apparatus having an inter-module data transfer

2   confirming function according to claim 1, wherein when

3   a plurality of data blocks are successively

4   transferred from said first module to said second

5   module, said descriptor setting means sets only said

6   data transfer confirmation flag in a data transfer

7   descriptor for transferring the last data block among

8   said plurality of data blocks to "ON".

1   8. The apparatus having an inter-module data transfer

2   confirming function according to claim 2, wherein when

3   a plurality of data blocks are successively

4   transferred from said first module to said second

5   module, said descriptor setting means sets only said

6   data transfer confirmation flag in a data transfer

7   descriptor for transferring the last data block among

8   said plurality of data blocks to "ON".

1   9. The apparatus having an inter-module data transfer

2   confirming function according to claim 3, wherein when

3   a plurality of data blocks are successively

4   transferred from said first module to said second

5   module, said descriptor setting means sets only said

6   data transfer confirmation flag in a data transfer

7   descriptor for transferring the last data block among

8   said plurality of data blocks to "ON".

1   10. The apparatus having an inter-module data transfer

2   confirming function according to claim 4, wherein when

3   a plurality of data blocks are successively

4   transferred from said first module to said second

5   module, said descriptor setting means sets only said

6   data transfer confirmation flag in a data transfer

7   descriptor for transferring the last data block among

8   said plurality of data blocks to "ON".

1   11. The apparatus having an inter-module data transfer

2   confirming function according to claim 5, wherein when

3   a plurality of data blocks are successively

4   transferred from said first module to said second

5   module, said descriptor setting means sets only said

6   data transfer confirmation flag in a data transfer

7   descriptor for transferring the last data block among

8   said plurality of data blocks to "ON".

1   12. The apparatus having an inter-module data transfer

2   confirming function according to claim 6, wherein when

3   a plurality of data blocks are successively

4   transferred from said first module to said second

5   module, said descriptor setting means sets only said

6   data transfer confirmation flag in a data transfer

7   descriptor for transferring the last data block among

8   said plurality of data blocks to "ON".

1   13. A storage controlling apparatus disposed between

2   a disk unit and a host to control an access to said

3   disk unit from said host, said storage controlling

4   apparatus comprising:

5   a disk interface module for controlling an

6   interface with said disk unit;

7   a host interface module for controlling an

8   interface with said host;

9   a management module for generally managing

10   the whole of said apparatus;

11   a bridge module connected said disk interface

12   module, said host interface module and said management

13   module through interface buses to connect said disk

14   interface module, said host interface module and said

15   management module to one another so that data can be

16   transferred among said disk interface module, said

17   host interface module and said management module; and

18   a confirmation code setting means for setting,

19   in said bridge module, a confirmation code for

20   confirming data transfer from said bridge module to

21   said management module when said disk interface module

22   or said host interface module transfers data to said

23   management module via said bridge module through said

24   interface buses;

25   said disk interface module and/or said host

26 interface module (hereinafter referred simply as said

27 interface module) comprising:

28   a descriptor setting means for

29 setting a data transfer descriptor containing

30 transfer information required for data transfer to

31 said management module and a data transfer

32 confirmation flag;

33   a descriptor generating means for

34 automatically generating, when said data transfer

35 confirmation flag is "ON", a data transfer

36 confirmation descriptor containing a confirmation

37 code reading information, which is required to read

38 out said confirmation code from said bridge module to

39 said interface module, on the basis of said transfer

40 information in said data transfer descriptor set by

41 said descriptor setting means; and

42   a controlling means for controlling

43 data transfer to said management module according to

44 said transfer information in said data transfer

45 descriptor set by said descriptor setting means, and

46 for controlling, when said data transfer confirmation

47 flag is "ON", after the data transfer to said

48 management module is completed, reading of said

49 confirmation code from said bridge module according

50 to said confirmation code reading information in said

51 data transfer confirmation descriptor automatically

52 generated by said descriptor generating means.

1   14. The storage controlling apparatus according to

2   claim 13, wherein said interface module comprises:

3   a first processing unit for generally

4   managing said interface module;

5   a second processing unit for carrying out

6   data transfer through said interface buses according

7   to an instruction from said first processing unit;

8   said first processing unit fulfilling a

9   function as said descriptor setting means; and

10   said second processing unit fulfilling

11 functions as said descriptor generating means and said

12 controlling means.

1   15. The storage controlling apparatus according to

2   claim 13, wherein said interface module comprises:

3   a first determining means for determining,

4   on the basis of said confirmation code read out from

5   said bridge module, whether data transfer between said

6   bridge module and said management module has been

7   carried out normally or abnormally; and

8   a second determining means for determining

9   whether data transfer between said interface module

10 and said bridge module has been carried out normally

11 or abnormally.

1   16. The storage controlling apparatus according to

2 claim 15, wherein when said first determining means

3 determines that the data transfer has been carried out

4 abnormally, said descriptor generating means

5 automatically generates an error reading descriptor

6 containing error reading information required to read

7 out detailed error information from said bridge module

8 to said interface module, and said controlling means

9 controls reading of said detailed error information

10 from said bridge module according to said error

11 reading information in said error reading descriptor

12 automatically generated by said descriptor

13 generating means.

1 17. The storage controlling apparatus according to

2 claim 16, wherein said interface module comprises:

3   a first processing unit for generally

4 managing said interface module;

5   a second processing unit for carrying out

6 data transfer through said interface buses according

7 to an instruction from said first processing unit;

8   said first processing unit fulfilling

9 functions as said descriptor setting means and said

10 second determining unit; and

11   said second processing unit fulfilling

12 functions as said descriptor generating means, said

13 controlling means and said first determining means.

1 18. The storage controlling apparatus according to

2 claim 17, wherein when said second determining unit

3 determines that the data transfer has been carried out

4 abnormally, said first processing unit obtains, from

5 said second processing unit, said detailed error

6 information read out from said bridge module, and

7 instructs said second processing unit to re-transfer

8 the data on the basis of said detailed error

9 information.

1 19. The storage controlling apparatus according to

2 claim 13, when a plurality of data blocks are

3 successively transferred from said interface module

4 to said management module, said descriptor setting

5 means sets only said data transfer confirmation flag

6 in a data transfer descriptor for transferring the

7 last data block among said plurality of data blocks

8 to "ON".

1 20. The storage controlling apparatus according to

2 claim 14, when a plurality of data blocks are

3 successively transferred from said interface module

4 to said management module, said descriptor setting

5 means sets only said data transfer confirmation flag

6 in a data transfer descriptor for transferring the

7 last data block among said plurality of data blocks

8 to "ON".

1 21. The storage controlling apparatus according to
2 claim 15, when a plurality of data blocks are
3 successively transferred from said interface module
4 to said management module, said descriptor setting
5 means sets only said data transfer confirmation flag
6 in a data transfer descriptor for transferring the
7 last data block among said plurality of data blocks
8 to "ON".

1 22. The storage controlling apparatus according to
2 claim 16, when a plurality of data blocks are
3 successively transferred from said interface module
4 to said management module, said descriptor setting
5 means sets only said data transfer confirmation flag
6 in a data transfer descriptor for transferring the
7 last data block among said plurality of data blocks
8 to "ON".

1 23. The storage controlling apparatus according to
2 claim 17, when a plurality of data blocks are
3 successively transferred from said interface module
4 to said management module, said descriptor setting
5 means sets only said data transfer confirmation flag
6 in a data transfer descriptor for transferring the
7 last data block among said plurality of data blocks
8 to "ON".

1   24. The storage controlling apparatus according to

2   claim 18, when a plurality of data blocks are

3   successively transferred from said interface module

4   to said management module, said descriptor setting

5   means sets only said data transfer confirmation flag

6   in a data transfer descriptor for transferring the

7   last data block among said plurality of data blocks

8   to "ON".

1   25. An interface module for a storage controlling

2   apparatus disposed between a disk unit and a host to

3   control an access from said host to said disk unit,

4   said storage controlling apparatus comprising said

5   interface module for controlling an interface with

6   said disk unit or said host, a management module for

7   generally managing the whole of said storage

8   controlling apparatus, a bridge module connected said

9   interface module and said management module through

10   interface buses to connect said interface module and

11   said management module to each other so that data can

12   be transferred between said interface module and said

13   management module, and a confirmation code setting

14   means for setting, in said bridge module, a

15   confirmation code for confirming data transfer from

16   said bridge module to said management module when said

17   interface module transfers data to said management

18   module via said bridge module through said interface

19   buses, said interface module comprising:

20   a descriptor setting means for setting a data

21   transfer descriptor containing transfer information

22   required for data transfer to said management module

23   and a data transfer confirmation flag;

24   a   descriptor   generating   means   for

25   automatically generating, when said data transfer

26   confirmation   flag   is   "ON",   a   data   transfer

27   confirmation descriptor containing confirmation code

28   reading information, which is required to read out

29   said confirmation code from said bridge module to said

30   interface   module,   on   the   basis   of   said   transfer

31   information in said data transfer descriptor set by

32   said descriptor setting means; and

33   a   controlling   means   for   controlling   data

34   transfer to said management module according to said

35   transfer information in said data transfer descriptor

36   set   by   said   descriptor   setting   means,   and   for

37   controlling, when said data transfer confirmation

38   flag is "ON", after the data transfer to said

39   management   module   is   competed,   reading   of   said

40   confirmation code from said bridge module according

41   to said confirmation code reading information in said

42   data transfer confirmation descriptor automatically

43   generated by said descriptor generating means.

1 26. The interface module for a storage controlling

2 apparatus according to claim 25 comprising:

3   a first processing unit for generally

4 managing said interface module;

5   a second processing unit for carrying out

6 data transfer through said interface buses according

7 to an instruction from said first processing unit;

8   said first processing unit fulfilling a

9 function as said descriptor generating means; and

10   said second processing unit fulfilling

11 functions as said descriptor generating means and said

12 controlling means.

1 27. The interface module for a storage controlling

2 apparatus according to claim 25 further comprising:

3   a first determining means for determining

4 whether data transfer between said bridge module and

5 said management module has been carried out normally

6 or abnormally, on the basis of said confirmation code

7 read out from said bridge module; and

8   a second determining means for determining

9 whether data transfer between said interface module

10 and said bridge module has been carried out normally

11 or abnormally.

1 28. The interface module for a storage controlling

2 apparatus according to claim 27, wherein when said

3   first determining unit determines that the data

4   transfer has been carried out abnormally, said

5   descriptor generating means automatically generates

6   an error reading descriptor containing error reading

7   information required to read out detailed error

8   information from said bridge module to said interface

9   module, and said controlling means controls reading

10   of said detailed error information from said bridge

11   module according to said error reading information in

12   said error reading descriptor automatically

13   generated by said descriptor generating means.

1   29. The interface module for a storage controlling

2   apparatus according to claim 28 comprising:

3   a first processing unit for generally

4   managing said interface module;

5   a second processing unit for carrying out

6   data transfer through said interface buses according

7   to an instruction from said first processing unit;

8   said first processing unit fulfilling

9   functions as said descriptor setting means and said

10   second determining unit; and

11   said second processing unit fulfilling

12   functions as said descriptor generating means, said

13   controlling means and said first determining means.

1   30. The interface module for a storage controlling

2 apparatus according to claim 29, wherein when said

3 second determining means determines that the data

4 transfer has been carried out abnormally, said first

5 processing unit obtains, from said second processing

6 unit, said detailed error information read out from

7 said bridge module, and instructs said second

8 processing unit to re-transfer the data on the basis

9 of said detailed error information.

1 31. The interface module for a storage controlling

2 apparatus according to claim 25, wherein when a

3 plurality of data blocks are successively transferred

4 from said interface module to said management module,

5 said descriptor setting means sets only said data

6 transfer confirmation flag in a data transfer

7 descriptor for transferring the last data block among

8 said plurality of data blocks to "ON".

1 32. The interface module for a storage controlling

2 apparatus according to claim 26, wherein when a

3 plurality of data blocks are successively transferred

4 from said interface module to said management module,

5 said descriptor setting means sets only said data

6 transfer confirmation flag in a data transfer

7 descriptor for transferring the last data block among

8 said plurality of data blocks to "ON".

1 33. The interface module for a storage controlling

2 apparatus according to claim 27, wherein when a

3 plurality of data blocks are successively transferred

4 from said interface module to said management module,

5 said descriptor setting means sets only said data

6 transfer confirmation flag in a data transfer

7 descriptor for transferring the last data block among

8 said plurality of data blocks to "ON".

1 34. The interface module for a storage controlling

2 apparatus according to claim 28, wherein when a

3 plurality of data blocks are successively transferred

4 from said interface module to said management module,

5 said descriptor setting means sets only said data

6 transfer confirmation flag in a data transfer

7 descriptor for transferring the last data block among

8 said plurality of data blocks to "ON".

1 35. The interface module for a storage controlling

2 apparatus according to claim 29, wherein when a

3 plurality of data blocks are successively transferred

4 from said interface module to said management module,

5 said descriptor setting means sets only said data

6 transfer confirmation flag in a data transfer

7 descriptor for transferring the last data block among

8 said plurality of data blocks to "ON".

1   36. The interface module for a storage controlling

2   apparatus according to claim 30, wherein when a

3   plurality of data blocks are successively transferred

4   from said interface module to said management module,

5   said descriptor setting means sets only said data

6   transfer confirmation flag in a data transfer

7   descriptor for transferring the last data block among

8   said plurality of data blocks to "ON".